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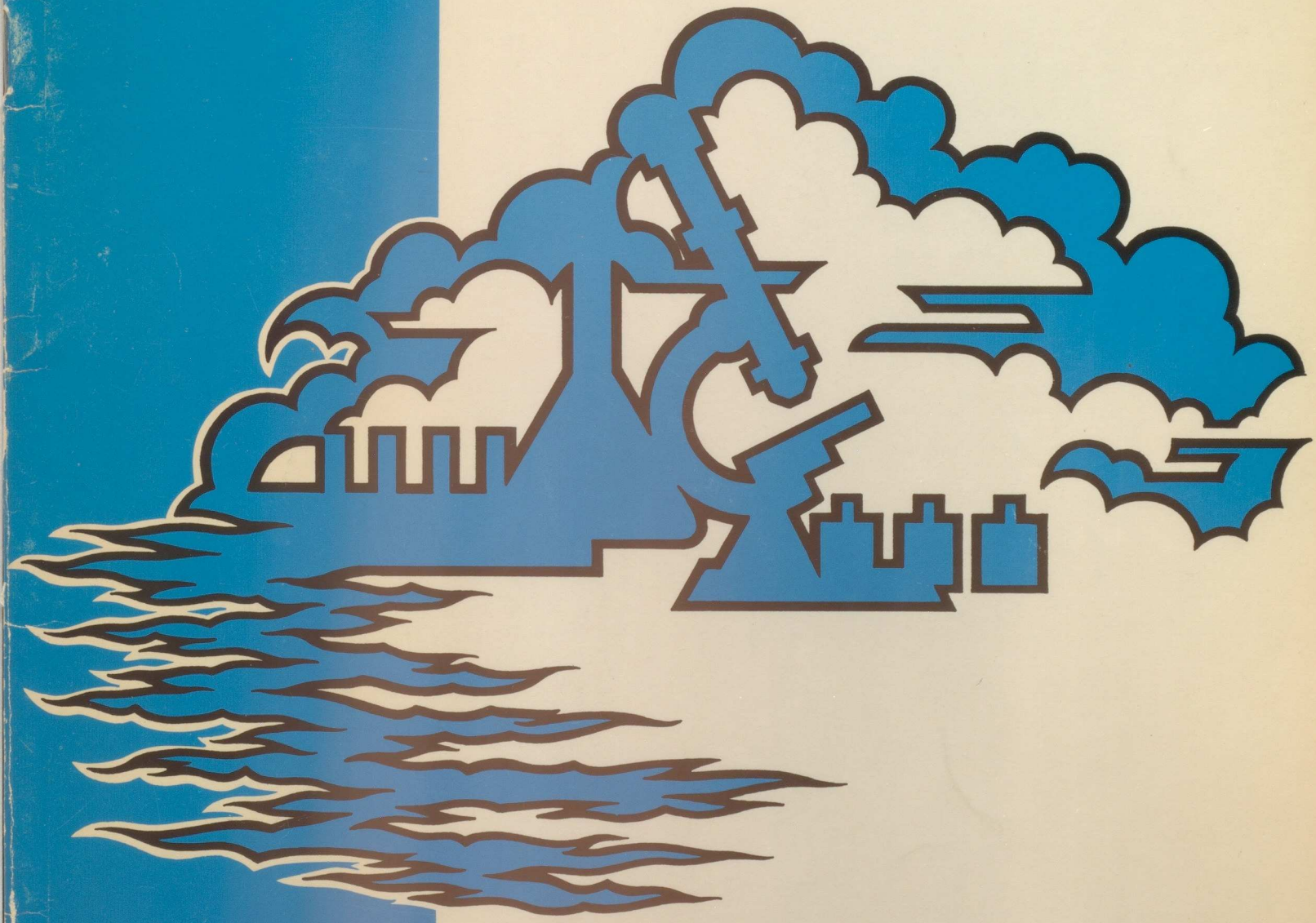
Great Lakes Research Advisory Board: Annual Report to the International Joint Commission: Presented July 1976

Great Lakes Research Advisory Board

GREAT LAKES
RESEARCH ADVISORY BOARD



INTERNATIONAL JOINT COMMISSION

ANNUAL REPORT OF THE
RESEARCH ADVISORY BOARD
JULY 1976

GREAT LAKES RESEARCH ADVISORY BOARD

ANNUAL REPORT

TO THE INTERNATIONAL JOINT COMMISSION

PRESENTED
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GREAT LAKES RESEARCH ADVISORY BOARD

ANNUAL REPORT

TO THE

INTERNATIONAL

JOINT COMMISSION

PRESENTED

JUNE 1978

INTERNATIONAL JOINT COMMISSION

GREAT LAKES RESEARCH ADVISORY BOARD

June 1976

International Joint Commission

Canada and United States

Gentlemen:

The International Great Lakes Research Advisory Board, in partial fulfillment of its responsibility under the Water Quality Agreement of 1972, is submitting the following Annual Report on the activities of the Board and its working Committees. This report is accompanied by the Board's Report on Great Lakes Water Quality Research Needs.

Respectfully submitted,

A. R. LeFeuvre

Dr. A. R. LeFeuvre
Chairman
Canadian Section

D. I. Mount

Dr. D. I. Mount
Chairman
United States Section

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The Board's Standing Committee on Social Sciences, Economic and Legal Aspects is sponsoring a conference to examine alternative legal and economic policy mechanisms which are currently being used or which could be applied to achieve environmental quality objectives in those jurisdictions of Canada and the United States that border the Great Lakes.

The activities of the Board's Standing Committees included the provision of expert assistance to the Subcommittees of the Water Quality Board and the Task Groups of the Pollution from Land Use Activities Reference Groups, and the development of research projects to meet their needs.

- The Research Advisory Board's Standing Committee on the Scientific Basis for Water Quality Criteria has performed a continuing advisory role to the Water Quality Board's Water Quality Objectives Subcommittee in developing recommendations for uniform water quality objectives for the Great Lakes. The Standing Committee on Health Aspects of the Research Advisory Board is now providing a similar service.

- The Research Advisory Board's Standing Committee on Water and Wastewater Treatment, in response to a request from the Water Quality Board's Remedial Programs Subcommittee is reviewing innovative treatment processes which will reduce sludge disposal problems in the Great Lakes Basin.

- Members of the Research Advisory Board's Standing Committee on Social Sciences, Economic and Legal Aspects have worked with Task Group A of the Pollution from Land Use Activities Reference Group in the development of a public information/consultation program proposal for presentation to the Commission in July 1976. The program if approved, will strive to increase public awareness of land use problems and provide opportunity for the public to participate in the formulation of remedial measures recommendations.

C. Board Operations

Rules of procedure for Research Advisory Board meetings have been given tentative approval. The Board is reviewing the current Standing Committee structure to optimize its activities.

2 CONCLUSIONS & RECOMMENDATIONS

REPORT ON GREAT LAKES WATER QUALITY RESEARCH NEEDS

A separate report on research needs for enhancing water quality in the Great Lakes system accompanies this Annual Report. The Research Advisory Board recommends to the Commission that the entire report be forwarded to the Governments of the United States and Canada with the request that: it be distributed to all government agencies having research and development responsibilities relative to water quality in the Great Lakes System; and, that these agencies compare their present research programs with those outlined in this report. Further, the Board recommends that the Commission advise these agencies that follow-up contact will be made to them by the Research Advisory Board to ascertain the degree of responsiveness of the total United States - Canadian programs to the needs defined in the Great Lakes Water Quality Research Needs document.

WORKSHOPS

The recommendations of the workshops held this year were considered for inclusion in the above report, and only the conclusions are presented here.

The workshop on "Toxicity to Biota of Metal Forms in Natural Waters" sponsored by the Standing Committee on the Scientific Basis for Water Quality Criteria concluded that:

1) The impact of metals entering the Great Lakes depends on: their chemical form in the Great Lakes waters; the rates and processes involved in the equilibria established between the various forms; and the toxicity of the various forms of each heavy metal.

2) The current field testing techniques are inadequate to discriminate between and measure the various forms of metals in the Great Lakes. Efforts to address this problem are quite limited.

3) There are inadequate data on the biological impact of the various forms of heavy metals with the exception of mercury. Considerable recent work was reported on copper.

4) Until the above noted concerns are adequately addressed, water quality objectives based on total metal concentrations cannot be refined.

The conclusions of a workshop on "Public Information and Participation" sponsored by the Standing Committee on Social Sciences, Economic and Legal Aspects were:

1) Governments are not adequately utilizing accepted procedures for public information and participation techniques.

2) Agencies do not adequately employ available techniques for determining the knowledge level and interest intensity of publics potentially affected by decisions.

3) Governmental methods for choosing media channels and messages to most effectively reach specified public sectors appear inadequate.

4) The general public, although affected by governmental decisions made at any level, indirectly, is often apathetic; thus unrepresentative samples in surveys and over representation of some viewpoints at meetings and hearings result.

5) Governmental decision-making processes should utilize a weighting system to assure consideration of social, emotional and aesthetic human values as well as technical and scientific information.

The Standing Committee on Lake Dynamics held a workshop on "Stratified Flows in Large Lakes" from which it was concluded that:

1) Stratified flows, (i.e. underwater currents) are significant in lakewide, vertical mixing processes, but their role in releasing and distributing nutrients and contaminants from sediments has not been defined.

2) Within a given stratified layer, differences in dispersal rates may occur. The designation of a mixing zone, therefore, requires a detailed understanding of the internal dynamic behaviour of the water body within the area of concern.

3) Likewise, the interpretation of the results of vertical sampling techniques must take hydrodynamics into account.

4) New methodology is badly needed to better define the vertical profiles of both density and flow.

5) Effective modelling of changes in environmental quality requires solutions for the above noted problems.

3 INTRODUCTION

The Research Advisory Board was established under the provision of the April 1972 Canada-United States Agreement on Great Lakes Water Quality in order to:

1) Review at regular intervals research activities concerning the quality of the waters of the Great Lakes System in order to:

   (a) examine the adequacy and reliability of research results, their dissemination, and the effectiveness of their application;

   (b) identify deficiencies in their scope, and inadequacies in their funding and in completion schedules;

   (c) identify additional research projects that should be undertaken;

   (d) identify specific research programs for which international cooperation will be productive.

2) Provide advice and consolidations of scientific opinion to the Commission and its boards on particular problems referred to the Advisory Board by the Commission or its boards.

3) Facilitate both formal and informal international cooperation and coordination of research.

4) Make recommendations to the Commission.

This report is submitted in fulfillment of the Commission's request that all institutions formed under the Water Quality Agreement report on an annual basis.

4 ACCOMPLISHMENTS

REPORT ON GREAT LAKES WATER QUALITY RESEARCH NEEDS

In early 1975 the Board established a Research Needs Committee to provide a focus for the development of a report at regular intervals on the research needs concerning the quality of the waters of the Great Lakes System.

A report was prepared which identifies Great Lakes water quality issues in order of priority and delineates key research needs necessary for their resolution. Issues were defined as "perceived or anticipated problems requiring research and executive or political decision for their resolution".

Highest priority was assigned the most sensitive uses of the Great Lakes, i.e. drinking water and aquatic life. The second highest priority uses included recreation, aesthetics, industry and agriculture.

To prepare an information base, 1,500 members of the Great Lakes research community were each requested to provide their concepts of research needs related to water quality of the Great Lakes System. On the basis of the ensuing information and with the aid of the Board's Standing Committees, the Research Needs Committee developed 56 basic issues which, it felt, would adequately define Great Lakes water quality.

A three-day workshop was then arranged which was attended by 68 individuals who were particularly well qualified to discuss the identified issues. The attendees who functioned within thirteen work groups were directed to:

- criticize and discuss the defined issues within their scope and revise as considered necessary;
- identify research needs within the issues;
- document the issues and associated research needs;
- assign priorities to the issues and research needs.

The tasks of the thirteen work groups were then categorized according to the subject matter: ecological issues; technological issues; and, social, economic and political issues. Priorities were then established by discussion of all the recommendations within each of these categories. More details of the workshop are described in the Research Needs Report.

Following the workshop, the Committee edited the issues and research needs with a review by most workshop participants. The final report was reviewed and approved by the Research Advisory Board. The Board recommendations with respect to the report on Great Lakes Water Quality Research Needs are noted in Chapter II of this Annual Report.

WORKSHOP ON TOXICITY TO BIOTA OF METAL FORMS IN NATURAL WATERS

In July 1975, the Water Quality Board submitted to the Commission its recommendations for water quality objectives for the Great Lakes. Notably absent were objectives for metals because the Water Quality Objectives Subcommittee of the Water Quality Board and the Research Advisory Board's Standing Committee on the Scientific Basis for Water Quality Criteria, could not at that time prepare appropriate scientifically defensible objectives. One reason was that the underlying chemical and physiological bases for heavy metal toxicity in natural waters are not well understood.

Recent advances in analytical chemistry have offered the potential for on site monitoring of metal forms in water and for establishing the relationship between metal forms and their toxicity.

The Scientific Basis for Water Quality Criteria Committee therefore sponsored a workshop in Duluth, Minnesota on October 7-8, 1975 which:

- evaluated the applicability of recently developed instrumentation for metal toxicity studies;
- presented the latest research findings in the area of heavy metal forms (speciation), toxicity and cause-effect relationships;
- defined research needs which must be addressed to effectively develop objectives for metals in natural waters.

The workshop was attended by ninety researchers from Canada, the United States and England and consisted of two discussion periods and the presentation of fourteen papers. The general conclusions are presented in Chapter II of this report and the research needs were considered during the preparation of the Report on Great Lakes Water Quality Research Needs. Proceedings are available from the Commission's Regional Office in Windsor.

The significance of the research needs derived from the workshop is emphasized, in that the Water Quality Objectives Subcommittee following the workshop has stated in its Annual Report to the Water Quality Board (spring, 1976) that: "until the relationship between metal forms and their toxicity is firmly established, and until there are reliable methods for monitoring such forms, water quality objectives for metals will refer to total concentrations of each metal in an unfiltered (whole water), acid-digested sample".

WORKSHOP ON PUBLIC PARTICIPATION

To improve communications between the governments and the various publics concerned with activities within the Great Lakes Basin which may have impact on water quality, the Social Sciences, Economic and Legal Aspects Committee of the Research Advisory Board, sponsored a workshop to obtain a broad survey of the views of specialists on conveying information to the public and on encouraging public participation. There were 94 participants in this workshop which was held in Ann Arbor, Michigan, on June 24-25, 1975. Particular emphasis was placed on the activities of the International Joint Commission and participants discussed particularly:

- the need for and the means to accomplish increased public information and involvement;
- the effectiveness of various media for communication;
- advantages and disadvantages of various information/ involvement techniques such as public hearings.

To test the application of various techniques of possible benefit to the International Joint Commission and to give a definite direction to the workshop, a case study was developed on public involvement techniques for the Pollution from Land Use Activities Reference Group study. A report on the workshop was presented to the Commission at its 1975 Annual Meeting. Utilizing the results of the workshop, the Standing Committee on Social Sciences, Economic and Legal Aspects and Task Group "A" of the Reference Group have developed a program to inform and involve the public in the process of formulating remedial measures to minimize the effects of land use activities on water quality of the Great Lakes. Proceedings of the workshop are available from the Commission's Regional Office in Windsor.

WORKSHOP ON THE DYNAMICS OF STRATIFICATION AND STRATIFIED FLOWS IN LARGE LAKES

The Board's Standing Committee on Lake Dynamics has sponsored two workshops to improve the understanding and predictive capability related to transport and dispersal of introduced materials and heat in the Great Lakes. The first workshop described in the Board's previous annual report, dealt with the measurement of large scale dispersal in the Great Lakes; and the second workshop held on February 26, 1976, in Windsor, considered the mechanics of stratified flow in large lakes.

At the later workshop twenty-four participants from the United States and Canada discussed:

- the present understanding of the dynamics of internal behaviour of the Great Lakes;
- the necessity to consider this behaviour in the design of surveillance programs and in lake management strategies, such as the designation of mixing zones; and
- the role of stratified flows (i.e. underwater currents) in mixing processes which may release and distribute nutrients and contaminants from sediments.

DIRECTORY OF GREAT LAKES RESEARCH AND RELATED ACTIVITIES

In January 1976 the Board published the 1976 Directory of Great Lakes Research and Related Activities. The Directory was prepared on the basis of responses from over 750 members of the Great Lakes research community.

This publication provided baseline data for the Board's Report on Great Lakes Water Quality Research Needs by describing current research programs so that the need for additional research could be established. Also, it was distributed to all contributors and members of the joint institutions within the IJC to facilitate both formal and informal international cooperation and coordination of research.

REVIEW OF OIL SPILL REMEDIAL TECHNOLOGY IN FAST FLOWING WATERS

A preliminary report based on available literature was drafted by the Regional Office for the benefit of the Research Advisory Board. An updated report was provided to the Board in a presentation by Mr. N. Vanderkooy of the Environmental Protection Service of Environment Canada. Generally speaking, it was concluded that current oil spill contingency measures on fast flowing waters would only control free floating oil slicks under ideal weather conditions. If however, wind or ice are present, or the oil is dispersed at various water depths, the measures (i.e. barriers) would be totally ineffective.

The research needs identified during this presentation were forwarded to the Research Needs Committee, and considered during the preparation of the Report on Great Lakes Water Quality Research Needs.

DISTRIBUTION OF PROCEEDINGS OF PREVIOUS WORKSHOPS

Proceedings of workshops discussed in the Board's July, 1975 Report to the Commission were published and distributed upon request to researchers in thirteen different countries. The proceedings were those of workshops on: "*Cladophora* in the Great Lakes"; "Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms"; and "Measurement of Long-Term, Large-Scale Drift and Dispersal Patterns in the Great Lakes".

5 CURRENT ACTIVITIES

WORKSHOP ON FLUVIAL TRANSPORT OF SEDIMENT ASSOCIATED NUTRIENTS AND CONTAMINANTS

As studies of the Pollution from Land Use Activities Reference Group (PLUARG) progress, it is becoming evident that pollution from non-point sources may be a real threat to the Great Lakes. Of great concern is the lack of knowledge of the basic processes transporting contaminants to the lakes, transformations which may occur during their movement to and in the lake and their ultimate effect on the ecosystem. For example, the role of suspended solids in the transport of nutrients and contaminants is not defined.

To aid the PLUARG studies, the Research Advisory Board is sponsoring a workshop in October 1976, to provide an assessment of the state of knowledge and to determine research needs which must be addressed in the area of sediment, nutrient and other contaminant movement in streams and lakes, and their effects on aquatic ecosystems.

The workshop will also provide a basis for discussion to resolve problems specific to the Great Lakes watershed.

CONFERENCE ON LEGAL AND ECONOMIC MECHANISMS FOR ACHIEVING ENVIRONMENTAL QUALITY OBJECTIVES IN THE GREAT LAKES REGIONS OF CANADA AND THE UNITED STATES

Remedial actions have been and will be required to control the levels of water pollution in the Great Lakes. Some remedial actions have not proceeded as rapidly or as effectively as expected.

The Social Sciences, Economics and Legal Aspects Committee of the Research Advisory Board is sponsoring a conference in February 1977 to examine alternative legal and economic policy mechanisms which are currently being used or which could be applied to achieve environmental quality objectives in jurisdictions of Canada and the United States that border the Great Lakes. The major objective of the conference is to provide an improved foundation for policy development within the Great Lakes Basin.

TASK FORCE ON CHLORINATION

In response to a request by the Water Quality Board, the Research Advisory Board has appointed a Task Force to consider the implications of implementing a water quality objective of 2 micrograms per liter total residual chlorine for waters outside designated mixing zones in the Great Lakes. The Task Force

will consider: historical data on chlorine and microbiological levels in the boundary waters of the Great Lakes; guidelines for use by jurisdictions in selecting sites where chlorination requirements could be relaxed without adversely affecting public health; new sampling and laboratory methodologies required to monitor the proposed chlorine objective; delineate the interactions and conflicts which may arise in attempting to achieve both the existing IJC microbiology objective and the proposed chlorine objective; the biological impact of alternatives to chlorination and the significance of the possible formation and bioaccumulation of carcinogenic chlorinated organic compounds in all waters and wastewaters subjected to chlorination.

The Water Quality Board will base its recommendation of the proposed chlorine objective, on the final report of the Task Force.

DEVELOPMENT OF GREAT LAKES WATER QUALITY OBJECTIVES

The Standing Committee on the Scientific Basis for Water Quality Criteria has continued to function in an advisory role to the Water Quality Objectives Subcommittee of the Water Quality Board in the development of uniform water quality objectives for the Great Lakes. The two groups have met jointly on eight occasions within this one-year reporting period. Recently the Research Advisory Board's Standing Committee on Health Aspects has joined the two groups in this assignment by reviewing the proposed water quality objectives in terms of effects on human health.

During the joint meetings, new and revised water quality objectives have been considered for:

Aluminum	Nitrates and Nitrites
Arsenic	Detergents
Cadmium	Cyanide
Chromium	Fluoride
Copper	Oxygen
Lead	Temperature
Nickel	Diazinon
Vanadium	Parathion
Iron	Guthion
Mercury	Biological Value Allocation
Selenium	
Silver	
Zinc	

Some of these objectives will be forwarded to the Water Quality Board for consideration in spring 1976. The objectives for metals are subject to the limitations expressed on page 8 of this report.

Furthermore the Standing Committee on the Scientific Basis for Water Quality Criteria is aiding in the development of guidelines for defining mixing zones in the Great Lakes.

EVALUATION OF HEALTH EFFECTS OF ENVIRONMENTAL POLLUTANTS

The Board's Standing Committee on Health Aspects is actively reviewing ongoing work on the health hazards associated with pesticides, mercury, PCBs, asbestos, radionuclides and carcinogens from chlorination. The purpose of the review is to monitor ongoing research as well as to identify additional research which needs to be done. Furthermore, the results of the Committee's discussions will be transmitted to the groups responsible for defining water quality objectives.

WASTEWATER TREATMENT

The Board's Standing Committee on Water and Wastewater Treatment has actively undertaken to review existing efforts, and define and recommend approaches for the solution of significant problems associated with wastewater treatment in the Great Lakes Basin:

a) Sludge Disposal

The Remedial Programs Subcommittee of the Water Quality Board has recently requested this Committee to consider innovative wastewater treatment processes which will reduce the sludge disposal problem in the Great Lakes Basin.

The Committee is reviewing existing efforts in both countries with respect to innovative processes and their possible effectiveness of application. A Committee report on this subject will be forwarded to the Board upon its completion.

b) Storm and Combined Sewers

The Committee has under continual review, storm and combined sewer research programs in Canada and the United States. There is good international cooperation and coordination of applicable research and the Committee has not noted any current inadequacies in the research efforts and funding.

c) Operational Efficiency of Wastewater Treatment Plants

The Committee has been advised that U. S. EPA has awarded two contracts to address the subject of effective operation of wastewater treatment facilities. The Committee has expressed concern respecting this matter in previous reports.

d) Energy Conservation in Pollution Abatement

Developments in this subject in both countries are under review, and the Committee will make recommendations for additional projects if necessary.

6 BOARD OPERATIONS

MEMBERSHIP

In March 1976, Dr. D. I. Mount, Director of the Environmental Research Laboratory in Duluth, Minnesota was appointed Chairman of the United States Section of the Great Lakes Research Advisory Board, replacing Dr. A. F. Bartsch.

In November 1975, Dr. J. R. Vallentyne was appointed as a Canadian member of the Research Advisory Board replacing Dr. M. G. Johnson. Dr. Vallentyne, who is senior scientific advisor, Ocean and Aquatic Affairs, Fisheries and Marine Service, Environment Canada, previously was a member of the Board.

Mr. Paul Foley, Coordinator, Development and Research Group, Ontario Ministry of the Environment, was reappointed for his second three year term to the Board.

Professor Joseph Shapiro, Geology and Ecology Department, University of Minnesota and Professor Archie J. McDonnell, Water Resources Center, Pennsylvania State University were appointed to the Board in November 1975, as representatives of the states of Minnesota and Pennsylvania respectively. They replace Dr. Leo Hetling and Mr. C. M. Fetterolf, Jr. who represented the states of New York and Michigan respectively.

The Commission approved the appointment of the Executive Secretary of the Great Lakes Fishery Commission as ex officio member of the Board. Mr. C. M. Fetterolf, Jr. now serves on the Board in this capacity.

Mr. Floyd Elder, of the Canada Center for Inland Waters, also serves as ex officio member of the Board in his capacity as president of the International Association for Great Lakes Research.

RULES OF PROCEDURE

The Board has proposed rules of procedures for Board meetings and Committee membership.

COMMITTEE STRUCTURE

The Board has appointed a Task Force to review the Research Advisory Board Standing Committee structure "... with a view to recommending either the continuation of the present structure or specific changes as required..." "...Bearing in mind that needs for specific expertise exist within the functions of the Board, the Task Force should explore various alternative arrangements that might accomplish the same needs by different structures..."

RESPONSE OF GOVERNMENTS

The Research Advisory Board is pleased that the Governments of the United States and Canada have responded to the recommendations contained in the Commission's Second Annual Report. It is hoped such responses will be received following the Governments' review of each Annual Report. The Board notes that the Governments have responded to its recommended research on: the hazards of waterborne viruses; disinfection of sewage effluent; and the effects of PCBs on fish reproduction in the Great Lakes as well as their effects on human health.

The Board in its last annual report noted that it had requested the Commission to ask the Governments to describe their methods of conveying research needs to the agencies responsible for conducting research into environmental problems. This would enable the Board to express its recommendations on research needs in the most useful form. The Commission had on May 13, 1975 forwarded the Board's concerns to the Governments of Canada and the United States. No response has been received in this regard. Since the audience has not been defined, the task of designing a report on research needs and stating recommendations within the Board's Annual Report is most difficult.

7 MEMBERSHIP LIST RESEARCH ADVISORY BOARD 1976

UNITED STATES SECTION

Dr. A. F. Bartsch (Chairman - Resigned March/76)
Director
National Environ. Research Center
200 S. W. 35th Street
Corvallis, Oregon 97330

Dr. D. I. Mount (Chairman - Effective March 1976)
Director
Environmental Research Laboratory
6201 Congdon Avenue
Duluth, Minnesota 55804

Dr. Eugene J. Aubert
Director, Great Lakes Environmental Research Laboratory
National Oceanographic and Atmospheric Administration
2300 Washtenaw Avenue
Ann Arbor, Michigan 48104

Professor Leonard B. Dworsky
Civil and Environmental Engineering
Cornell University
302 Hollister Hall
Ithaca, New York 14853

Mr. Alvin R. Balden
19 Alina Lane
Hot Springs Village, Arkansas 71901

Mrs. Evelyn Stebbins
Citizens for Clean Air and Water Inc.
705 Elmwood
Rocky River, Ohio 44116

Dr. Herbert E. Allen
Assistant Professor
Department of Environmental Engineering
Illinois Institute of Technology
Chicago, Illinois 60616

Dr. L. J. Hetling (Resigned Nov/75)
Director, Environmental Quality
Environmental Research & Development
N.Y. Dept. of Environ. Conservation
50 Wolf Road, Room 519
Albany, New York 12201

Mr. C. M. Fetterolf, Jr. (Resigned June/75 as Michigan state representative; appointed ex officio member June/75)
Executive Secretary
Great Lakes Fishery Commission
1451 Green Road
Ann Arbor, Michigan 48107

Professor Archie J. McDonnell (Effective Nov/75)
Department of Civil Engineering
Water Resources Research Center
The Pennsylvania State University
University Park, Pennsylvania 16802

Professor Joseph Shapiro (Effective Nov/75)
Geology Department
University of Minnesota
220 Pillsbury Hall
Minneapolis, Minnesota 55455

Secretariat Responsibilities
Dr. Dennis E. Konasewich
Research Scientist
Great Lakes Regional Office
International Joint Commission
100 Ouellette Avenue, 8th Floor
Windsor, Ontario N9A 6T3

CANADIAN SECTION

Dr. A. R. LeFeuvre (Chairman)
Director
Canada Centre for Inland Waters
Environment Canada
P. O. Box 5050
Burlington, Ontario L7R 4A6

Mr. Arnold J. Drapeau
Professor
Ecole Polytechnique
Campus de L'Universite de Montreal
C. P. 6079 - Succursale "A"
Montreal, Quebec H3C 3A7

Mr. H. R. Holland
462 Charlesworth Lane
Sarnia, Ontario N7Y 2R2

Mr. Paul D. Foley
Coordinator
Development and Research Group
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario M4V 1P5

Dr. J. C. N. Westwood
Professor & Head of Microbiology
and Immunology
Faculty of Medicine
University of Ottawa
Ottawa, Ontario K1N 6N5

Mr. J. Douglas Roseborough
Director
Fish and Wildlife Research Branch
Ontario Ministry of Natural Resources
P. O. Box 50
Maple, Ontario L0J 1E0

Mrs. Mary Munro
3020 First Street
Burlington, Ontario L7N 1C3

Dr. M. G. Johnson (Resigned Nov/75)
Director
Great Lakes Biolimnology Laboratory
Canada Centre for Inland Waters
P. O. Box 5050
Burlington, Ontario L7R 4A6

Dr. J. R. Vallentyne (Effective Nov/75)
Senior Scientific Advisor
Ocean & Aquatic Affairs
Fisheries and Marine Service
Environment Canada
580 Booth Street
Ottawa, Ontario K1A 0H3

Ex Officio Member
Mr. Floyd C. Elder
A/Head, Basin Investigation and
Modelling Section
Canada Centre for Inland Waters
Environment Canada
P.O. Box 5050
Burlington, Ontario L7R 4A6

Secretariat Responsibilities
Dr. Dennis E. Konasewich
Research Scientist
Great Lakes Regional Office
International Joint Commission
100 Ouellette Avenue, 8th Floor
Windsor, Ontario N9A 6T3

8 MEMBERSHIP LIST STANDING COMMITTEES 1976

STANDING COMMITTEE ON ANALYTICAL SAMPLING AND MEASUREMENT METHODS

Dr. J. R. Kramer (Chairman pending)
Geology Dept., McMaster University
Hamilton, Ontario

Mr. Paul L. Diosady
Ontario Ministry of the Environment
Rexdale, Ontario

Dr. Claire L. Schelske
Great Lakes Research Division
University of Michigan
Ann Arbor, Michigan

Dr. J. L. Clark (Secretariat)
IJC Regional Office

STANDING COMMITTEE – EDITORIAL COMMITTEE

Mr. Alvin R. Balden (Chairman)
19 Alina Lane
Hot Springs Village, Arkansas

Mr. H. R. Holland
Sarnia, Ontario

Mrs. Mary Munro
Burlington, Ontario

Dr. Dennis E. Konasewich (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON EUTROPHICATION

Dr. Richard A. Vollenweider (Chairman)
Senior Scientist
Canada Centre for Inland Waters
Burlington, Ontario

Dr. A. M. Beeton
The University of Wisconsin-Milwaukee

Dr. Peter Dillon
Ontario Ministry of the Environment
Rexdale, Ontario

Dr. A. Hamilton
Freshwater Institute
Winnipeg, Manitoba

Dr. Norbert A. Jaworski
U. S. Environmental Protection Agency
Triangle Park, North Carolina

Dr. G. Fred Lee
Institute for Environmental Sciences
The University of Texas at Dallas
Richardson, Texas

Mr. M. F. P. Michalski
Ontario Ministry of the Environment
Rexdale, Ontario

Dr. Claire L. Schelske
Great Lakes Research Division
University of Michigan
Ann Arbor, Michigan

Dr. H. Shear (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON HEALTH ASPECTS

Dr. G. J. Stopps (Chairman)
Dept. of Preventive Medicine
and Biostatistics
University of Toronto
Toronto, Ontario

Dr. G. C. Becking
Health and Welfare Canada
Ottawa, Ontario

Mr. B. J. Dutka
Canada Centre for Inland Waters
Burlington, Ontario

Mr. S. K. Krishnaswami
National Energy Board
Ottawa, Ontario

Dr. Leland J. McCabe
National Environmental Research Centre
Cincinnati, Ohio

Dr. L. A. Plumlee
U. S. Environmental Protection Agency
Washington, D. C.

Dr. J. C. N. Westwood
Faculty of Medicine
University of Ottawa,

Dr. H. E. B. Humphrey
Michigan Dept. of Public Health
Lansing, Michigan

Dr. John L. Clark (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON LAKE DYNAMICS

Dr. Clifford H. Mortimer (Chairman)
Director
Centre for Great Lakes Studies
University of Wisconsin
Milwaukee, Wisconsin

Mr. M. Barton Hoglund
Environmental Technology
Assessment Inc.
Oak Brook, Illinois

Dr. Mervin D. Palmer
Ontario Ministry of the Environment
Toronto, Ontario

Dr. G. Keith Rodgers
Canada Centre for Inland Waters
Burlington, Ontario

Dr. T. J. Simons
Canada Centre for Inland Waters
Burlington, Ontario

Dr. T. R. Sundaram
Hydronautics, Inc.
Laurel, Maryland

Dr. A. E. P. Watson (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON RESEARCH NEEDS

Dr. Eugene J. Aubert (Chairman)
Director
Great Lakes Environmental Research Laboratory
National Oceanographic and Atmospheric Administration
Ann Arbor, Michigan

Dr. Herbert E. Allen
Illinois Institute of Technology
Chicago, Illinois

Mr. J. Douglas Roseborough
Ontario Ministry of Natural Resources
Maple, Ontario

Dr. A. E. P. Watson (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON SCIENTIFIC BASIS FOR WATER QUALITY CRITERIA

Dr. Andrew Robertson, (Acting Chairman)
Great Lakes Environmental Research Laboratory
National Oceanographic and Atmospheric Administration
Ann Arbor, Michigan

Dr. William Brungs
U. S. Environmental Protection Agency
Duluth, Minnesota

Mr. Carlos Fetterolf, Jr.
Great Lake Fishery Commission
Ann Arbor, Michigan

Dr. R. Hartung
University of Michigan
Ann Arbor, Michigan

Dr. I. Hoffman
National Research Council of Canada
Ottawa, Ontario

Mr. S. W. Reeder
Inland Waters Directorate
Environment Canada
Ottawa, Ontario

Dr. John Sprague (resigned)
University of Guelph
Guelph, Ontario

Dr. W. M. Strachan
Canada Centre for Inland Waters
Burlington, Ontario

Dr. Dennis E. Konasewich (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON SOCIAL SCIENCES, ECONOMIC AND LEGAL ASPECTS

Mr. Leonard T. Crook (Chairman)
Executive Director
Great Lakes Basin Commission
Ann Arbor, Michigan

Mr. Henry L. DeGraff
U. S. Department of Commerce
Washington, D. C.

Mr. James P. Dooley
Michigan Department of
Natural Resources
Lansing, Michigan

Dr. Leonard B. Dworsky
Cornell University
Ithaca, New York

Mr. Neil Mulvaney
Ontario Ministry of the Environment
Toronto, Ontario

Mrs. Mary Munro
Burlington, Ontario

Professor Norman Pearson
University of Western Ontario
London, Ontario

Ms. Ellen Prosser
Great Lakes Basin Commission
Ann Arbor, Michigan

Mr. S. Clasky
Ontario Ministry of Treasury
Economic and Intergovernmental Affairs
Toronto, Ontario

Dr. Frank Quinn
Environment Canada
Ottawa, Ontario

Mr. Robert Reed
Great Lakes Basin Commission
Ann Arbor, Michigan

Mr. Victor Rudik
Ontario Ministry of the Environment
Toronto, Ontario

Mr. Ronald Shimizu
Environment Canada
Toronto, Ontario

Miss Peggy Sinclair
Inland Waters Directorate Ontario Region
Burlington, Ontario

Mrs. Evelyn Stebbins
Cleveland Citizens for Clean Air
and Waters Inc.
Rocky River, Ohio

Dr. A. E. P. Watson (Secretariat)
IJC Regional Office

STANDING COMMITTEE ON WATER AND WASTEWATER TREATMENT

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Head
Process Development Section
Wastewater Technology Centre
Burlington, Ontario

Mr. A. R. Balden
Hot Springs Village, Arkansas

Mr. John Convery
U. S. Environmental Protection Agency
Cincinnati, Ohio

Mr. R. J. Courchaine
Michigan Department of Natural Resources
Lansing, Michigan

Mr. J. W. G. Rupke
Regional Municipality of York
New Market, Ontario

Mrs. Ann Vajdic
Ontario Ministry of the Environment
Toronto, Ontario

Dr. B. M. Ellis
EVS Consultants Ltd.
Coquitlam, British Columbia

Dr. G. Henry
University of Toronto
Toronto, Ontario

Dr. Leo J. Hetling (resigned)
New York State Department of Environmental Conservation
Albany, New York

Dr. K. L. Murphy (resigned)
McMaster University
Hamilton, Ontario

Dr. J. Walter Weber, Jr. (resigned)
University of Michigan
Ann Arbor, Michigan

Dr. Dennis E. Konasewich (Secretariat)
IJC Regional Office